Blackfoot River Monitoring Project

A Water Quality Sampling Project for the Blackfoot River's Tributaries

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Developed for: Caribou Soil Conservation District
Central Bingham Soil and Water Conservation District
North Bingham Soil Conservation District
Blackfoot River Watershed Council
Idaho Soil Conservation Commission
Idaho State Department of Agriculture
Department of Environmental Quality, Pocatello Regional Office

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INTRODUCTION

The Subbasin Assessment for the Blackfoot watershed Total Maximum Daily Load (TMDL) analysis is currently being written. Several stream segments have been listed in the TMDL for different pollutants. These pollutants include, but are not limited to, sediment, nutrients, flow alteration, and organics. The purpose of a monitoring project for the Blackfoot River is to help identify where agricultural related pollutant sources are coming from and determine the effectiveness of Best Management Practices (BMPs) installed on range and farm lands. The hydrologic unit code for the Blackfoot watershed is 17040207.

The Blackfoot River originates from several tributaries that flow from the southeast corner of the hydrologic unit code, in Caribou County. Most of these tributaries start in U.S. Forest Service ground then flow through portions of Bureau of Land Management, State of Idaho, and private lands. Some of the major tributaries are Lane, Diamond, Angus, Dry Valley, Slug, and Trail creeks. These enter the river before the Blackfoot Reservoir. Two tributaries, Lanes and Diamond creeks, flow together to form the Blackfoot River. The river then flows into the Blackfoot Reservoir. The Blackfoot Reservoir is operated by the U.S. Bureau of Indian Affairs and covers 17,300 surface acres (Rowe 2000). Meadow Creek and the Little Blackfoot River enter the system at the reservoir. Downstream of the reservoir, the river enters into Bingham County. The river has several large tributaries that enter into it after the reservoir. They include Corral, Brush, Wolverine, and Rawlins creeks. Approximately twenty river miles from entering Bingham County, the river forms the boundary line for the county and Fort Hall Indian Reservation. It remains the boundary until the Blackfoot River enters into the Snake River. The Blackfoot River skirts around the south end of the City of Blackfoot, which is the major city located on the Blackfoot River. There is also a small Equalizing Reservoir just east of the City of Blackfoot. The Blackfoot River flows for approximately 130 miles and drains about 700,000 acres before entering the Snake River. There are over 1,700 miles of streams in Bingham, Caribou, and Bonneville counties that flow into the Blackfoot River (Rowe 2000).

The monitoring of the Blackfoot watershed will be a group effort with many different agencies. Monitoring will be coordinated for the Blackfoot River by the Caribou Soil Conservation District, Central Bingham Soil and Water Conservation District, North Bingham Soil Conservation District, the Blackfoot Watershed Council (Watershed Advisory Group), Idaho Soil Conservation Commission (ISCC), Pocatello Regional Department of Environmental Quality (IDEQ), Idaho State Department of Agriculture (ISDA), and Idaho Association of Soil Conservation Districts (IASCD). Along with these agencies, the Natural Resources Conservation Service (NRCS), Idaho State Department of Fish and Game (IDF&G), and U.S. Geological Survey (USGS) will provide support in reducing pollutants in the Blackfoot Subbasin.

BACKGROUND

Several tributaries and the Blackfoot River are listed on the State of Idaho's 303(d) list they published in concerns to the Clean Water Act's Section 303(d). The tributaries are primarily listed for sediment with the exception of Wolverine Creek that is also listed for nutrients. The

Blackfoot River is listed for nutrients, sediment, organics, and flow alteration. These pollutants can stress the human, aquatic, and terrestrial wildlife, when it impacts the beneficial use of the stream. The beneficial uses for the Blackfoot River and its tributaries are cold water biota and salmonid spawning. The primary land uses in the subbasin are agriculture, rangeland, and mining (Rowe 2000).

The upper Blackfoot River will include the tributaries that flow into it before it enters the Blackfoot Reservoir. A few of these tributaries are Lanes, Sheep, Angus, Diamond, Bacon, Timothy, Dry Valley, Slug and Trail creeks. Sheep and Bacon creeks enter Lanes Creek before it confluences with Diamond Creek to form the Blackfoot River. Angus Creek then flows into the Blackfoot River. Angus Creek has phosphorus mining in its headwaters. There is some monitoring taking place in Angus Creek for mining pollutants. Dry Valley Creek, also impacted by mining operations, Slug and Trail creeks flow into the Blackfoot River before the reservoir. The Blackfoot River and Diamond, Angus, and Slug creeks will have monitoring sites on them.

Lanes Creek makes up the headwaters of the Blackfoot River. Lanes Creek flows primarily through private land. There is one section of State Land that Lanes Creek flows through before the confluence with Diamond Creek. Some of the tributaries that flow into Lanes Creek include Chippy, Sheep, and Bacon creeks. Lanes Creek is primarily impacted by grazing and is listed for sediment for a pollutant. Diamond Creek flows together with Lanes Creek to form the Blackfoot River. Diamond Creek flows through both U.S. Forest Service lands and private lands before coming together with Lanes Creek. Some of the tributaries that flow into Diamond Creek include Yellowjacket and Timothy creeks. Diamond Creek is primarily impacted by grazing and is listed for sediment for a pollutant.

Angus Creek flows into the Blackfoot River a little over a mile below the confluence of Lanes and Diamond creeks. It flows through both U.S. Forest Service land and private lands. The headwaters of Angus Creek are impacted by mining, while the lower section of Angus is impacted by grazing. Sediment is the pollutant of concern.

Slug Creek flows into the Blackfoot River. It flows through U.S. Forest Service land and private lands. It is fed by many springs. Grazing impacts the stream and sediment is listed as the pollutant of concern.

Meadow Creek flows into the Blackfoot Reservoir. Water is taken from Grays Lake, in the Willow Creek subbasin, and transferred into the Blackfoot subbasin through Meadow Creek. This water is regulated by U.S. Bureau of Indian Affairs.

Below the reservoir, there are several tributaries. Some are Corral, Rawlins, Miner, Brush and Wolverine creeks. Monitoring will be done on Corral, Rawlins, Brush and Wolverine creeks.

Corral Creek flows into the Blackfoot River below the Blackfoot Reservoir. It flows through State Land and private land. Some of the tributaries that flow into Corral Creek include Grizzly, Thompson, and Bear creeks. It is impacted by recreation and grazing. Sediment is the pollutant of concern.

Brush Creek flows directly into the Blackfoot River. It flows through private and State Lands before entering the Blackfoot River. Rawlins Creek is its major tributary. Grazing and roads impact the stream. Sediment is the pollutant of concern.

Rawlins Creek flows through private and State Lands before flowing into Brush Creek. Its tributaries include Horse and Poison creeks. Grazing and roads impacts the land. Rawlins Creek is currently not on the 303(d) list.

Wolverine Creek flows through private and BLM lands before entering the Blackfoot River. Jones Creek is the major tributary to Wolverine Creek. Recreation and grazing impact this watershed. It is listed for nutrients and sediment as pollutants.

PROGRAM OBJECTIVES

IASCD will work in cooperation with the above mentioned agencies in attempt to complete the following objectives:

- Evaluate the impact of agriculture on the tributaries and mainstream of the Blackfoot River.
- Evaluate the water quality and discharge rates at various locations within these creeks and drains.
- Attempt to determine which areas contribute to the greatest level of loading with respect to TMDL parameters.
- Locate future areas where BMPs may be implemented and riparian evaluations may reduce sediment loads.
- Use this data for public awareness.

MONITORING PROGRAM

This monitoring program will be implemented by IASCD with assistance from ISCC, ISDA, SCD, NRCS, and DEQ. Other groups may assist in technical or fieldwork as needed. If more support is needed to assist in the gathering of monitoring data, university personnel may assist when available.

There will be a total of eight monitoring sites located throughout the watershed.

Above the reservoir, monitoring will be done on Diamond, Angus, and Slug creeks and the Blackfoot River. The Blackfoot River site will be located directly downstream from the confluence with Lanes and Diamond creeks. Diamond Creek will have a monitoring site located on it. The site will be on U.S. Forest Service Land directly above the private lands. Angus Creek will have one monitoring site on it as close to the confluence with the Blackfoot River.

Slug Creek will have one monitoring site located on it. It will be located as close to the confluence with the Blackfoot River.

Below the reservoir, monitoring will be done on Corral, Brush, Rawlins, and Wolverine creeks. Corral Creek will have one monitoring site above the confluence with the Blackfoot River. Brush Creek will have one monitoring site above the confluence with the Blackfoot River. Rawlins Creek will have one monitoring site above the confluence with Brush Creek. Wolverine Creek will have one monitoring site located above the confluence with the Blackfoot River.

The monitoring will take place for one year and possibly throughout the 2001 hydrologic cycle to capture a complete data set. Samples will be collected on a bi-weekly schedule beginning in mid May 1999. Bi-weekly monitoring will continue throughout the summer and into the fall. The monitoring schedule will then switch to monthly for the winter months and early spring. When possible, additional monitoring may take place during certain storm events to assess their impacts on sediment loading.

TABLE 1

MONITORING SITES FOR THE BLACKFOOT RIVER	
1	Wolverine Creek (303(d) listed)
2	Brush Creek (303(d) listed)
3	Rawlins Creek (not 303(d) listed)
4	Corral Creek (303(d) listed)
5	Slug Creek (303(d) listed)
6	Angus Creek (303(d) listed)
7	Diamond Creek (303(d) listed)
8	Blackfoot River (303(d) listed)

SAMPLING METHODS

WATER QUALITY

Samples for water quality analyses will be collected by grab sampling directly from the source. The actual sampling sites, within the creeks and drains, will be located far enough upstream to avoid any backwater effects caused by other tributaries entering the stream. For very incised shallow creeks, six one-liter grab samples will be collected from a well-mixed section, near mid-stream at approximately mid-depth. For larger creeks, multiple grab samples will be collected at equal intervals across the stream's cross section to provide a representative sample. For shallow water sites (1 foot deep or less) grab samples will be collected by hand using a clean one-liter stainless steel container. At sites where the water depth is greater than one foot, a DH-81 integrated sampler will be used for water collection. Whichever method is used, individual samples will be collected at equal intervals across the entire width of the drain or creek. Each

discrete sample will in turn be composited as mentioned in the following paragraph. The actual location, number of grabs, and sample collection technique will be determined after observing the conditions at each sampling location.

With the exception of bacteriological samples, each grab sample will be composited into a 2.5-gallon polyethylene churn sample splitter. The resultant composite sample will then be thoroughly homogenized and poured off into properly prepared sample containers. For samples requiring filtration (ortho-phosphorous), a portion of the sample water will be transferred into the filtration unit and pressure filtered though a 0.45µm GN-6 Gelman Metricel Filter. The resultant filtrate will be transferred directly into a properly prepared sample bottle. The filtration unit will be thoroughly rinsed with deionized water and equipped with a new 0.45 µm filter at each sampling location. Water for nutrients, that require preservation, will be transferred into preserved (H_2SO_4 pH <2) 500 ml sample containers. The polyethylene churn splitter will be thoroughly rinsed with source water at each location prior to sample collection. Bacteriological samples will be collected directly from the midstream discharge into properly prepared sterile sample bottles. Refer to Table 2 for a list of parameters, analytical methods, preservation, and holding times.

All sample containers will be equipped with sample labels that will be filled out using water proof markers with the following information: station location, sample identification, date of collection, and time of collection. Clear packing tape will be wrapped around each sample bottle and its label to insure that moisture from the coolers does not cause the loss of sample labels. All resultant samples will be placed within a cooler, on ice, to await shipment to the laboratory. Chain-of-Custody forms will accompany each sample shipment. Samples will be delivered to IAS-EnviroChem in Pocatello, Idaho. Bacteriological testing will be same day delivered IAS-EnviroChem.

TABLE 2. WATER QUALITY PARAMETERS

Parameters	Sample Size	Preservation	Holding Time	**Method**
Non Filterable Residue (TSS)	200 ml	Cool 4°C	7 Days	EPA 160.2
Volatile Residue (TVS)	200 ml	Cool 4°C	7 Days	EPA 160.4
Nitrogen-nitrate/nitrite	50 ml	Cool 4 °C H_2SO_4 pH<2	28 Days	EPA 300
Total Phosphorus	100 ml	Cool 4 °C, H2SO4 pH < 2	28 Days	EPA 365.4
Ortho Phosphorus	100 ml	Filtered , Cool 4°C	24 Hours	EPA 365.2
Fecal Coliform, *Escherichia coli*	250 ml 250 ml	Cool 4 °C	30 Hours 6 Hours	ASTM 909C EPA 1103.1

FIELD MEASUREMENTS

At each location, field parameters for dissolved oxygen, specific conductance, pH, temperature, and total dissolved solids will be measured. These measurements will be taken, when possible, from a well-mixed section, near mid-stream at approximately mid-depth. Calibration of all field equipment will be in accordance with the manufacture specifications. Refer to Table 3 for a listing of field measurements, equipment and calibration techniques. Photo points and GPS points will be taken at each monitoring site.

TABLE 3. FIELD MEASUREMENTS

Parameters	Instrument	Calibration
Dissolved Oxygen	YSI Model 55	Ambient air calibration
Temperature	YSI Model 55	Centigrade thermometer
Conductance & TDS	Orion Model 115	Conductance standards
pH	Orion Model 210A	Standard buffer (7,10) bracketing for linearity

All field measurements will be recorded in a bound logbook along with any pertinent observations about the site, including weather conditions, flow rates, personnel on site, or any problems observed that might effect the quality of data.

FLOW MEASUREMENTS

Discharge rates will be measured on drains and creeks that do not have an established rating station or staff gauge. Flow rates will be measured in an area upstream from the drain's discharge (into the river) to insure the measurements are not biased by potential backwater effects caused by the river.

Flow measurements will be made with a Marsh McBirney Flow Mate Model 2000 flow meter. The six-tenth-depth method (0.6 of the total depth below water surface) will be used when the depth of water is less than or equal to three feet. For depths greater than three feet the two-point method (0.2 and 0.8 of the total depth below the water surface) will be employed. At each gauging station, a transect line will be established across the width of the drain/creek at a perpendicular angle to the flow. The mid-section method for computing cross-sectional area along with the velocity-area method will be used for discharge determination. The discharge is computed by summation of the products of the partial areas (partial sections) of the flow cross-sections and the average velocities for each of those sections. This method will be used to calculate cubic feet per second at each of the monitoring stations.

QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

The Intermountain Analytical Services – EnviroChem utilizes EPA approved and validated methods. A method validation process including precision and accuracy performance evaluations and method detection limit studies are required of all of IAS EnviroChem standard operating procedures. Method performance evaluations include quality control samples, analyzed with a batch to ensure sample data integrity. Internal laboratory spikes and duplicates are all part of IAS EnviroChem's quality assurance program. Laboratory QA/QC results generated from this project can be provided upon request.

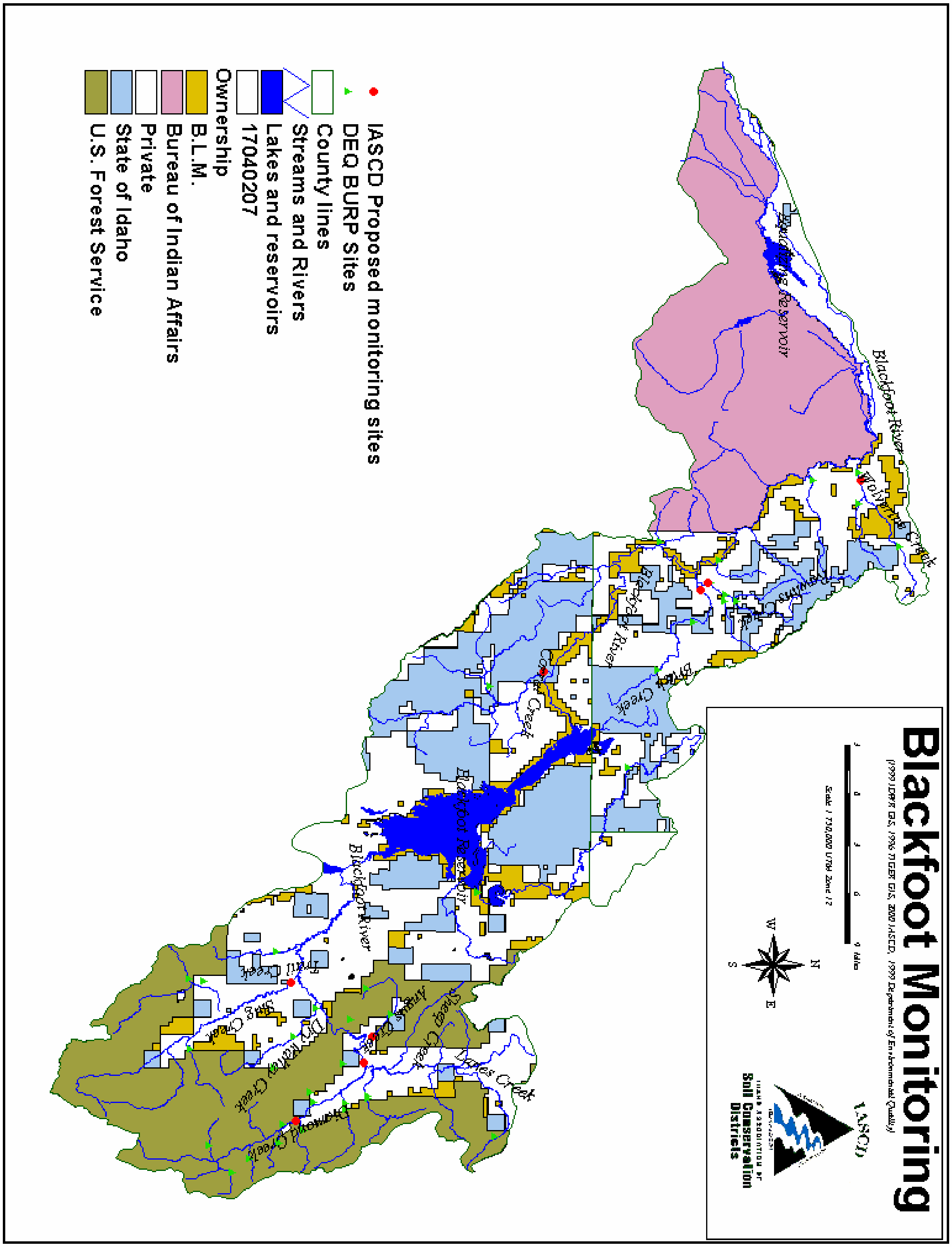
QA/QC procedures from the field-sampling portion of this project will consist of duplicates (at 10% of the sample load) along with blank samples (one set per sampling event). The field blanks consist of laboratory grade deionized water, transported to the field, and poured off into prepared sample container. The dissolved phosphorous blank will be collected by filtering deionized water through the filtration unit and transferring the resultant filtrate into an appropriate sample container. The blank sample is used to determine the integrity of the field teams handling of samples, the condition of the sample containers supplied by the laboratory and the accuracy of the laboratory methods. Duplicates consist of two sets of sample containers filled with the same composite water from the same sampling site. The duplicates are used to determine both field and laboratory precision. The duplicate samples will not be identified as such and will enter the laboratories blindly for analyses. Both the duplicates and blank samples are stored and handled with the normal sample load for shipment to the laboratory.

DATA HANDLING

All of the field data and analytical data generated from each sampling event will be reviewed by IASCD and ISDA staff. Each batch of data from a survey will be reviewed to insure that all necessary observations, measurements, and analytical results have been properly recorded. The analytical results will be reviewed for completeness and quality control results. Any suspected errors will be investigated and resolved if possible. The data will then be stored electronically and made available to any interested entity.

DATA USE

The data collected will be assessed by IASCD and ISDA staff for quality and completeness review. The data will then be available for agencies and individuals upon request. IASCD, ISDA, SCC, and SWCDs will use the data to determine loads of sediment or nutrients. This data would also provide information on where to implement specific BMPs. The monitoring will allow agencies to have background information to develop implementation projects for the TMDL and measure project effectiveness. IASCD staff will be providing updates to the districts, WAG, and others on a periodic basis. IASCD will be producing a report at the conclusion of this project. This data can be used for educational purposes to landowners and can be tied together with biological data from IF&G or DEQ to provide a larger database.


Blackfoot Monitoring
IASCD Proposed monitoring sites
DEQ BURP Sites
County lines
Streams and Rivers
Lakes and reservoirs
17040207
Ownership
B.L.M.
Bureau of Indian Affairs
Private
State of Idaho
U.S. Forest Service
Soil Conservation Districts
Blackfoot River
Wolverine Creek
Blackfoot Reservoir
Diamond Creek
Jones Creek
Sheep Creek
Slug Creek
Lanes Creek

REFERENCES

Rowe, M. 2000. Draft Blackfoot River Waterbody Assessment. Idaho Department of Environmental Quality. Pocatello, Idaho.